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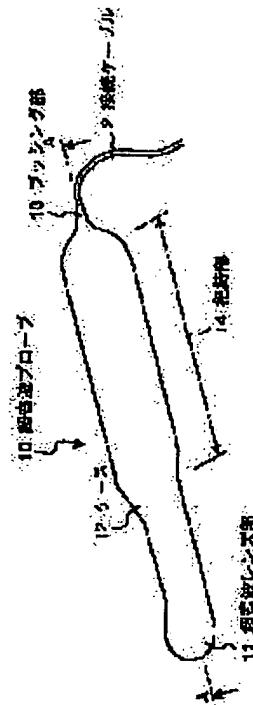
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## (54) ULTRASONIC PROBE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To reduce the manufacturing cost of an ultrasonic probe by reducing the numbers of parts and dies and to enhance the grippability of the probe.

**SOLUTION:** An ultrasonic element 3, a broad cable 4, a connector 5, and a fixed member 6 with a connecting cable 2 assembled thereto are inserted into a die, and an ultrasonic lens part 11, a case 12 and a bushing part 13 are integrally molded by insert molding. Since the ultrasonic probe 10 is manufactured using the single die, the number of parts is reduced and assembly processes are also reduced to achieve a reduction in the manufacturing cost.



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## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective diagram showing the outline composition of the ultrasonic probe concerning the gestalt 1 of operation.

[Drawing 2] It is the A-A line cross section of the ultrasonic probe 10 shown in drawing 1.

[Drawing 3] It is drawing showing the installation method of the holddown member 6 at the time of preparing the positioning section in metal mold and a holddown member 6.

[Drawing 4] It is the perspective diagram showing the outline composition of the ultrasonic probe 20 which is the gestalt 2 of implementation of this invention.

[Drawing 5] It is the B-B line cross section of the ultrasonic probe 20 shown in drawing 4.

[Drawing 6] It is the assembly drawing of the ultrasonic probe 20 shown in drawing 4.

[Drawing 7] It is the perspective diagram showing the outline composition of the ultrasonic probe 30 which is the form 3 of implementation of this invention.

[Drawing 8] It is the C-C line cross section of the ultrasonic probe 30 shown in drawing 7.

[Drawing 9] It is the perspective diagram showing the outline composition of the ultrasonic probe 40 which is the form 4 of implementation of this invention.

[Drawing 10] It is the D-D line cross section of the ultrasonic probe 40 shown in drawing 9.

[Drawing 11] It is the perspective diagram showing the outline composition of the ultrasonic probe 50 which is the form 5 of implementation of this invention.

[Drawing 12] It is the E-E line cross section of the ultrasonic probe 50 shown in drawing 11.

[Drawing 13] It is the perspective diagram showing the outline composition of the ultrasonic probe 60 which is the form 6 of implementation of this invention.

[Drawing 14] It is the F-F line cross section of the ultrasonic probe 60 shown in drawing 13.

[Drawing 15] It is the perspective diagram showing the outline composition of the conventional ultrasonic probe.

[Drawing 16] It is the assembly drawing of the conventional ultrasonic probe shown in drawing 15.

[Description of Notations]

2 Interconnection Cable

3 Ultrasonic Element

4 Broadcloth Cable

5 Connector

6 Holddown Member

6a, 6b Positioning section

10, 20, 30, 40, 50, 60, 70 Ultrasonic probe

11, 21, 31, 41, 51, 61, 71 Ultrasonic lens section

12, 22, 32, 42, 52, 62, 72 Case

13, 23, 33, 43, 53, 63, 73 Bushing section

14, 24, 44, 54, 64, 74 Grasping section

15 Bottom -- Metal Mold

16a, 16b Gage pin

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[Translation done.]



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**DETAILED DESCRIPTION**

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] About the ultrasonic probe which picturizes an object by reflection of an ultrasonic wave, especially, this invention reduces a manufacturing cost and relates to the ultrasonic probe which improved grip nature further.

[0002]

[Description of the Prior Art] Conventionally, an ultrasonic wave is irradiated at an object and the ultrasonic image pck-up equipment which picturizes the interior of target by imaging the reflected wave is widely used for nondestructive inspection. To a living body, since it is harmless, especially ultrasonic image pck-up equipment of an ultrasonic wave is useful as medical application, and it is used for detection of a foreign matter in the living body, the judgment of the degree of a lesion, observation of a tumor, observation of an embryo, etc.

[0003] When acquiring the local information on target according to an ultrasonic wave, it is common for an operator to grasp and to use the ultrasonic probe which can contact the part of the target request.

Drawing 15 is the perspective diagram showing the outline composition of the conventional ultrasonic probe. Moreover, drawing 16 is the assembly drawing of the ultrasonic probe shown in drawing 15. In drawing 15 and drawing 16, the ultrasonic probe 100 equips with the ultrasonic element 3 the point of the case 102 formed by rigid resin. a case 102 -- a case -- member 102a and a case -- a member -- it was formed combining 102b, opening was prepared near the ultrasonic element 3, and the ultrasonic lens section 101 is attached

[0004] The broadcloth cable 4 connected to the ultrasonic element 3 is connected to an interconnection cable 2 through a connector 5, and an interconnection cable 2 is connected to the ultrasonic image pck-up equipment which is not illustrated. Moreover, the bushing section 103 is formed in the installation section by which an interconnection cable 2 pierces through a case 102. The bushing section 103 is formed of materials, such as rubber, is restricting the incurvation in the installation section of an interconnection cable 2, and functions as the cable protection section which prevents breakage of an interconnection cable 2. Moreover, the case 102 has formed the grasping section 104 which an operator can grasp, and has established two or more crevices 105 in the grasping section 104 as a skid.

[0005] Power is supplied to the ultrasonic element 3 from the broadcloth cable 4, and it generates an ultrasonic wave. It is completed by the ultrasonic lens section 101 and the generated ultrasonic wave is irradiated for an image pck-up. Moreover, the ultrasonic element 3 receives the reflected wave which is an ultrasonic wave reflected for the image pck-up, changes it into an electrical signal, and is outputted to the broadcloth cable 4. The broadcloth cable 4 is transmitted to the ultrasonic image pck-up equipment which does not illustrate the electrical signal which the ultrasonic element 3 outputted through a connector 5 and an interconnection cable 2. Ultrasonic image pck-up equipment creates the picture for an image pck-up based on the electrical signal received from the interconnection cable 2.

[0006] When picturizing, an operator grasps the grasping section 104 and picturizes by applying the ultrasonic lens section 101 to the part of the request for an image pck-up. At this time, it is common to

apply the solvent for ultrasonic examinations to the candidate for an image pick-up. The solvent for ultrasonic examinations has an acoustic impedance near a human body, is a solvent of the gel which prevents attenuation of an ultrasonic wave, and can suppress a multiple echo by applying this solvent, and can prevent a noise. Moreover, the information inside a living body is acquirable by inserting the point of the ultrasonic probe 100 in the inside of a coelome, i.e., an esophagus, intestines, a vagina, the anus, etc.

[0007]

[Problem(s) to be Solved by the Invention] however -- the conventional ultrasonic probe mentioned above -- a case -- since Members 102a and 102b, the ultrasonic lens section 101, and the bushing section 103 are combined, the metal mold for each parts is required, and the process which manufactures each part article separately, assembles it and is pasted up is required. For this reason, there was a trouble that a manufacturing cost became large.

[0008] Moreover, since the case 102 was formed by rigid resin, it was easy to slide at the time of work, there was risk of breakage by fall, and there was a trouble that it was stabilized and the focus of an ultrasonic wave could not be doubled.

[0009] this invention is made in view of the fault of the above-mentioned conventional technology, the number of parts and metal mold is reduced, a manufacturing cost is reduced, and it aims at offering the ultrasonic probe which improved grip nature further.

[0010]

[Means for Solving the Problem] In order to solve the technical problem mentioned above and to attain the purpose, invention concerning the 1st viewpoint. The ultrasonic element which oscillates an ultrasonic wave and changes the reflected wave of the ultrasonic wave concerned into an electrical signal, The case which is the ultrasonic probe which has the cable which performs the supply of power to the aforementioned ultrasonic element, and transfer of the aforementioned electrical signal, stored the aforementioned ultrasonic element, and prepared the grasping section which an operator can grasp, It is prepared in the installation section of the aforementioned cable, has the cable protection section which restricts crookedness of the cable concerned, and the ultrasonic lens which performs convergence of the aforementioned ultrasonic wave, and is characterized by really forming the aforementioned case, the aforementioned ultrasonic lens, and the aforementioned cable protection section by fabrication.

[0011] According to invention concerning this 1st viewpoint, by forming the case, the ultrasonic lens, and the cable protection section of an ultrasonic probe by one fabrication of a single material, the number of required metal mold can be decreased and grip nature can be improved further.

[0012] Moreover, the ultrasonic element which invention concerning the 2nd viewpoint oscillates an ultrasonic wave, and changes the reflected wave of the ultrasonic wave concerned into an electrical signal, The case which is the ultrasonic probe which has the cable which performs the supply of power to the aforementioned ultrasonic element, and transfer of the aforementioned electrical signal, stored the aforementioned ultrasonic element, and prepared the grasping section which an operator can grasp, It is prepared in the installation section of the aforementioned cable, has the cable protection section which restricts crookedness of the cable concerned, and the ultrasonic lens which performs convergence of the aforementioned ultrasonic wave, and is characterized by really forming the aforementioned ultrasonic lens and the aforementioned cable protection section by fabrication.

[0013] According to invention concerning this 2nd viewpoint, the number of required metal mold can be decreased by forming an ultrasonic lens and the cable protection section by one fabrication of a single material.

[0014] Moreover, in invention which invention concerning the 3rd viewpoint requires for the 2nd viewpoint, the aforementioned case is characterized by being formed in the front face of the aforementioned ultrasonic lens really [ aforementioned ] formed of fabrication, and the aforementioned cable protection section.

[0015] The number of required metal mold is decreased, and the intensity of an ultrasonic probe is made to improve by forming a case in the front face of the ultrasonic lens really formed by fabrication, and a cable attaching part according to invention concerning this 3rd viewpoint.

[0016] Moreover, the ultrasonic element which invention concerning the 4th viewpoint oscillates an ultrasonic wave, and changes the reflected wave of the ultrasonic wave concerned into an electrical signal, The case which is the ultrasonic probe which has the cable which performs the supply of power to the aforementioned ultrasonic element, and transfer of the aforementioned electrical signal, stored the aforementioned ultrasonic element, and prepared the grasping section which an operator can grasp, It has the ultrasonic lens which converges the aforementioned ultrasonic wave, and is characterized by really forming the aforementioned ultrasonic lens and the aforementioned case by fabrication.

[0017] The number of required metal mold is decreased and grip nature is made to improve further by forming the case and ultrasonic lens of an ultrasonic probe by one fabrication of a single material according to invention concerning this 4th viewpoint.

[0018] Moreover, the ultrasonic element which invention concerning the 5th viewpoint oscillates an ultrasonic wave, and changes the reflected wave of the ultrasonic wave concerned into an electrical signal, The case which is the ultrasonic probe which has the cable which performs the supply of power to the aforementioned ultrasonic element, and transfer of the aforementioned electrical signal, stored the aforementioned ultrasonic element, and prepared the grasping section which an operator can grasp, It is prepared in the installation section of the aforementioned cable, has the cable protection section which restricts crookedness of the cable concerned, and is characterized by really forming the aforementioned case and the aforementioned cable protection section by fabrication.

[0019] The number of required metal mold is decreased and grip nature is made to improve further by forming the case and the cable protection section of an ultrasonic probe by one fabrication of a single material according to invention concerning this 5th viewpoint.

[0020] Moreover, the ultrasonic element which invention concerning the 6th viewpoint oscillates an ultrasonic wave, and changes the reflected wave of the ultrasonic wave concerned into an electrical signal, The case which is the ultrasonic probe which has the cable which performs the supply of power to the aforementioned ultrasonic element, and transfer of the aforementioned electrical signal, stored the aforementioned ultrasonic element, and prepared the grasping section which an operator can grasp, It is prepared in the installation section of the aforementioned cable, and has the cable protection section which restricts crookedness of the cable concerned, and the ultrasonic lens which performs convergence of the aforementioned ultrasonic wave, and the aforementioned cable protection section is characterized by covering the aforementioned grasping section at least.

[0021] The grip nature at the time of work is made to improve by preparing the cable protection section which covers the grasping section of an ultrasonic probe according to invention concerning this 6th viewpoint.

[0022] Moreover, invention concerning the 7th viewpoint is characterized by forming the aforementioned cable protection section and the aforementioned case by the two color molding using common metal mold in invention concerning the 6th viewpoint.

[0023] According to invention concerning this 7th viewpoint, two color molding is used for the case of an ultrasonic probe, the cable protection section is formed, by covering the grasping section of an ultrasonic probe with the cable protection section, metal mold and a man day are cut down and the grip nature at the time of work is improved further.

[0024] Moreover, in invention concerning the 1st - the 7th viewpoint, invention concerning the 8th viewpoint is further equipped with the holddown member which fixes the aforementioned ultrasonic element, and is characterized by forming the aforementioned case, the aforementioned ultrasonic lens, and the aforementioned cable protection section in the front face of the holddown member concerned.

[0025] Since it is made to form a case, an ultrasonic lens, and the cable protection section in the front face of the holddown member which attached the ultrasonic element according to invention concerning this 8th viewpoint, an ultrasonic probe can be manufactured by insert molding.

[0026] Moreover, in invention which invention concerning the 9th viewpoint requires for the 8th viewpoint, the aforementioned holddown member has the positioning section which positions the aforementioned ultrasonic element, and is characterized by determining the physical relationship of the aforementioned ultrasonic element and the aforementioned ultrasonic lens-section-by the positioning

section concerned.

[0027] According to invention concerning this 9th viewpoint, the property of the ultrasonic lens section can be defined with high precision by determining the physical relationship of an ultrasonic element and the ultrasonic lens section by the positioning section prepared in the holddown member.

[0028]

[Embodiments of the Invention] Hereafter, the ultrasonic probe applied to the form of operation of this invention with reference to a drawing is explained in detail.

[0029] form 1. of operation -- the form 1 of this operation explains the ultrasonic probe 10 which really fabricated a case, the ultrasonic ultrasonic wave lens section, and the bushing section using drawing 1 - drawing 3 Moreover, it is the composition which prepared the point supposing inserting this ultrasonic probe 10 into a coelome, and attached the ultrasonic element to this point.

[0030] Drawing 1 is the perspective diagram showing the outline composition of the ultrasonic probe concerning the form 1 of operation. Moreover, drawing 2 is the A-A line cross section of the ultrasonic probe 10 shown in drawing 1. In drawing 1 and drawing 2, the ultrasonic probe 10 has the ultrasonic element 3, the broadcloth cable 4, a connector 5, and a holddown member 6 in the interior. The ultrasonic element 3 is attached to a holddown member 6, and is allotted near the point of a case 12. Moreover, the broadcloth cable 4 connected to the ultrasonic element 3 is connected to an interconnection cable 2 through a connector 5, and an interconnection cable 2 is connected to the ultrasonic image pck-up equipment which is not illustrated. In addition, the broadcloth cable 4, a connector 5, and an interconnection cable 2 are attached and fixed to a holddown member 6.

[0031] A case 12 forms the ultrasonic lens section 11 near the ultrasonic element 3. Moreover, in the installation section in which an interconnection cable 2 pierces through a case 12, a case 12 forms the bushing section 13. The bushing section 13 is restricting the incursion in the installation section of an interconnection cable 2, and functions as the cable protection section which prevents breakage of an interconnection cable 2. Furthermore, the case 12 is equipped with the grasping section 14 which an operator can grasp.

[0032] Power is supplied to the ultrasonic element 3 from the broadcloth cable 4, and it generates an ultrasonic wave. It is completed by the ultrasonic lens section 11 and the generated ultrasonic wave is irradiated for an image pck-up. Moreover, the ultrasonic element 3 receives the reflected wave which is an ultrasonic wave reflected for the image pck-up, changes it into an electrical signal, and is outputted to the broadcloth cable 4. The broadcloth cable 4 is transmitted to the ultrasonic image pck-up equipment which does not illustrate the electrical signal which the ultrasonic element 3 outputted through a connector 5 and an interconnection cable 2. Ultrasonic image pck-up equipment creates the picture for an image pck-up based on the electrical signal received from the interconnection cable 2.

[0033] When picturizing, an operator grasps the grasping section 14 and picturizes by applying the ultrasonic lens section 11 to the part of the request for an image pck-up. At this time, you may apply the solvent for ultrasonic examinations to the candidate for an image pck-up. The solvent for ultrasonic examinations has an acoustic impedance near a human body, is a solvent of the gel which prevents attenuation of an ultrasonic wave, and can suppress a multiple echo by applying this solvent, and can prevent a noise. Moreover, the information inside a living body is acquirable by inserting the point of the ultrasonic probe 10 in the inside of a coelome, i.e., an esophagus, intestines, a vagina, the anus, etc.

[0034] When manufacturing this ultrasonic probe 10, the ultrasonic element 3, the broadcloth cable 4, a connector 5, and an interconnection cable are first attached to a holddown member 6. Next, a holddown member 6 is installed in the interior of metal mold in which the cavity corresponding to the case 12 was prepared. Furthermore, in a cavity, by pouring in the silicon resin which functions as an ultrasonic lens, a case 12 can really be fabricated and the ultrasonic lens section 11 and the bushing section 13 can be formed simultaneously.

[0035] Here, the method of preparing the positioning section for positioning etc. can be arbitrarily chosen as the method, the metal mold, and the holddown member 6 which hang a holddown member 6 in a cavity, using an interconnection cable 2 as a method of installing a holddown member 6 in the interior of metal mold, and can be used for them. The installation method of the holddown member 6 at

the time of preparing the positioning section in metal mold and a holddown member 6 is shown in drawing 3 . drawing 3 -- setting -- the bottom -- metal mold 15 had the cavity 16 and equips the interior of a cavity 16 with gage pins 16a and 16b further Moreover, a holddown member 6 has positioning section 6a corresponding to gage-pin 16a, and positioning section 6b corresponding to gage-pin 16b. [0036] a holddown member 6 -- the bottom -- when installing in metal mold 15, the physical of metal mold 15 and a holddown member 6 can be determined by inserting gage-pin 16a in positioning section 6a, and inserting gage-pin 16b in positioning section 6b In order that the ultrasonic probe 10 may form the ultrasonic lens section 11 simultaneously by one formation of a case 12, the physical relationship of metal mold 15 and a holddown member 6 will determine the physical relationship of the ultrasonic element 3 and the ultrasonic lens section 11, and influences the property of the ultrasonic lens section 11. Therefore, the property of the ultrasonic lens section 11 can be defined with high precision by preparing gage-pin 16a and positioning section 6a near the ultrasonic lens section 11.

[0037] As explained above, since the ultrasonic probe 10 concerning the form 1 of operation forms simultaneously the ultrasonic lens section 11 and the bushing section 13 at the time of one fabrication of a case 12, it can manufacture the ultrasonic probe 10 with single metal mold. Therefore, part mark can be cut down, the process for assembly can be decreased, and curtailment of a manufacturing cost can be realized.

[0038] Moreover, since the ultrasonic lens section 11, a case 12, and the bushing section 13 are formed by one fabrication of the silicon material which functions as an ultrasonic lens, while fully achieving the function as the cable protection section in the bushing section 13, in the grasping section 14, slipping can be prevented and grip nature can be improved. Furthermore, by really fabricating a case 12, a crevice and a joint can be lost from the appearance of the ultrasonic probe 10, and appearance can be improved.

[0039] In addition, although the interconnection cable 2 and the broadcloth cable 4 are connected through a connector 5 with the form of this operation, it is good also as composition which soldered the interconnection cable 2 to the broadcloth cable 4 directly, and omitted the connector 5.

[0040] Form 2. of operation, next the ultrasonic probe concerning the form 2 of operation are explained. In the form 1 of operation mentioned above, although the ultrasonic probe 10 really formed a case 12, the ultrasonic lens section 11, and the bushing section 13 by fabrication, the ultrasonic probe 20 shown in the form 2 of this operation fabricates the ultrasonic lens section and a case independently, and it is fabricating the bushing section further so that a part of front face of a case may be worn. Other composition is the same as that of the ultrasonic probe 10 shown in the form 1 of operation, and gives the same sign to the same component.

[0041] Drawing 4 is the perspective diagram showing the outline composition of the ultrasonic probe 20 which is the form 2 of implementation of this invention. Moreover, drawing 5 is the B-B line cross section of the ultrasonic probe 20 shown in drawing 4 . In drawing 4 and drawing 5 , the ultrasonic probe 20 equips the point of a case 22 with the ultrasonic element 3. The broadcloth cable 4 connected to the ultrasonic element 3 is connected to an interconnection cable 2 through a connector 5, and an interconnection cable 2 is connected to the ultrasonic image pck-up equipment which is not illustrated.

[0042] Moreover, a case 22 is equipped with the grasping section 24 which an operator can grasp. Furthermore, the ultrasonic probe 20 is equipped with the bushing section 23 in the installation section in which an interconnection cable 2 pierces through a case 22. The bushing section 23 is restricting the crookedness in the installation section of an interconnection cable 2, and functions as the cable protection section which prevents breakage of an interconnection cable 2. Furthermore, the bushing section 23 covers the grasping section 24, and functions as a skid.

[0043] Power is supplied to the ultrasonic element 3 from the broadcloth cable 4, and it generates an ultrasonic wave. It is completed by the ultrasonic lens section 21 and the generated ultrasonic wave is irradiated for an image pck-up. Moreover, the ultrasonic element 3 receives the reflected wave which is an ultrasonic wave reflected for the image pck-up, changes it into an electrical signal, and is outputted to the broadcloth cable 4. The broadcloth cable 4 is transmitted to the ultrasonic image pck-up equipment which does not illustrate the electrical signal which the ultrasonic element 3 outputted through a

connector 5 and an interconnection cable 2. Ultrasonic image pck-up equipment creates the picture for an image pck-up based on the electrical signal received from the interconnection cable 2.

[0044] When picturizing, an operator grasps the grasping section 24 and picturizes by applying the ultrasonic lens section 21 to the part of the request for an image pck-up. At this time, you may apply the solvent for ultrasonic examinations to the candidate for an image pck-up. Moreover, the information inside a living body is acquirable by inserting the point of the ultrasonic probe 20 in the inside of a coelome, i.e., an esophagus, intestines, a vagina, the anus, etc.

[0045] Below, drawing 6 is used and explained about the manufacture method of this ultrasonic probe 20. Drawing 6 is the assembly drawing of the ultrasonic probe 20. the ultrasonic probe 20 -- the ultrasonic lens section 21 and a case -- member 22a and a case -- a member -- it manufactures by forming 22b independently, respectively and combining it

[0046] here -- a case -- member 22a and a case -- a member -- the bushing which 22b is formed of rigid resin and becomes the front face from the rubber-like quality of the material, respectively -- member 23a and a bushing -- a member -- it has 23b a bushing -- member 23a and a bushing -- a member -- 23b -- two color molding -- using -- a case -- the field corresponding to the grasping section 24 of Members 22a and 22b -- a wrap -- it forms like

[0047] as the manufacture procedure of the ultrasonic probe 20 -- first -- the ultrasonic lens section 21 and a case -- member 22a and a case -- a member -- 22b is formed, respectively the next -- a case -- a member -- the ultrasonic element 3, the broadcloth cable 4, a connector 5, and an interconnection cable 2 are attached to the interior of 22b furthermore, the ultrasonic lens section 21 and a case -- member 22a and a case -- a member -- the ultrasonic probe 20 can be obtained by assembling 22b

[0048] As explained above, since the ultrasonic probe 20 concerning the form 2 of operation forms the bushing section 23 and the case 22 using two color molding, it can reduce the metal mold used at the time of manufacture, can cut down like an erector, and can hold down a manufacturing cost.

[0049] Moreover, since the bushing section 23 is formed of a rubber-like material, while it fully achieves the function as the cable protection section, in the grasping section 24, it can prevent slipping and can improve grip nature.

[0050] In addition, although the interconnection cable 2 and the broadcloth cable 4 are connected through a connector 5 with the gestalt of this operation, it is good also as composition which soldered the interconnection cable 2 to the broadcloth cable 4 directly, and omitted the connector 5.

[0051] Gestalt 3. of operation, next the ultrasonic probe concerning the gestalt 3 of operation are explained. In the gestalt 1 of operation mentioned above, although the ultrasonic probe 10 really formed a case 12, the ultrasonic lens section 11, and the bushing section 13 by fabrication, the ultrasonic probe 30 shown in the gestalt 3 of this operation fabricates the ultrasonic lens section and the bushing section to one beforehand, and forms the case in the front face. Other composition is the same as that of the ultrasonic probe 10 shown in the gestalt 1 of operation, and gives the same sign to the same component.

[0052] Drawing 7 is the perspective diagram showing the outline composition of the ultrasonic probe 30 which is the gestalt 3 of implementation of this invention. Moreover, drawing 8 is the C-C line cross section of the ultrasonic probe 30 shown in drawing 7 . In drawing 7 and drawing 8 , the ultrasonic probe 30 was fabricated inside the case 32 at one, and is equipped with the silicon material which forms the ultrasonic lens section 31 and the bushing section 33. This silicon material has the ultrasonic element 3, the broadcloth cable 4, a connector 5, and a holddown member 6 in the interior.

[0053] The ultrasonic element 3 is attached to a holddown member 6, and is allotted near the point of a silicon material. Moreover, the broadcloth cable 4 connected to the ultrasonic element 3 is connected to an interconnection cable 2 through a connector 5, and an interconnection cable 2 is connected to the ultrasonic image pck-up equipment which is not illustrated. In addition, the broadcloth cable 4, a connector 5, and an interconnection cable 2 are attached and fixed to a holddown member 6.

[0054] A silicon material forms the ultrasonic lens section 31 near the ultrasonic element 3. Moreover, in the installation section in which an interconnection cable 2 pierces through a silicon material, a silicon material forms the bushing section 33. The bushing section 33 is restricting the incurvation in the installation section of an interconnection cable 2, and functions as the cable protection section which

prevents breakage of an interconnection cable 2. Furthermore, a case 32 exposes the ultrasonic lens section 31 and the bushing section 33, is wearing the front face of a silicon material, and forms the grasping section 34 which an operator can grasp.

[0055] Power is supplied to the ultrasonic element 3 from the broadcloth cable 4, and it generates an ultrasonic wave. It is completed by the ultrasonic lens section 31 and the generated ultrasonic wave is irradiated for an image pck-up. Moreover, the ultrasonic element 3 receives the reflected wave which is an ultrasonic wave reflected for the image pck-up, changes it into an electrical signal, and is outputted to the broadcloth cable 4. The broadcloth cable 4 is transmitted to the ultrasonic image pck-up equipment which does not illustrate the electrical signal which the ultrasonic element 3 outputted through a connector 5 and an interconnection cable 2. Ultrasonic image pck-up equipment creates the picture for an image pck-up based on the electrical signal received from the interconnection cable 2.

[0056] When picturizing, an operator grasps the grasping section 34 and picturizes by applying the ultrasonic lens section 31 to the part of the request for an image pck-up. At this time, you may apply the solvent for ultrasonic examinations to the candidate for an image pck-up. The solvent for ultrasonic examinations has an acoustic impedance near a human body, is a solvent of the gel which prevents attenuation of an ultrasonic wave, and can suppress a multiple echo by applying this solvent, and can prevent a noise. Moreover, the information inside a living body is acquirable by inserting the point of the ultrasonic probe 30 in the inside of a coelome, i.e., an esophagus, intestines, a vagina, the anus, etc.

[0057] When manufacturing this ultrasonic probe 30, the ultrasonic element 3, the broadcloth cable 4, a connector 5, and an interconnection cable 2 are first attached to a holddown member 6. Next, insert molding is used, a silicon material is fabricated around a holddown member 6, and the ultrasonic lens section 31 and the bushing section 33 are formed. Next, the ultrasonic probe 30 can be obtained by carrying out insert molding of the case 32 by rigid resin.

[0058] As explained above, since the ultrasonic probe 30 concerning the gestalt 3 of operation fabricates the ultrasonic lens section 31 and the bushing section 33 to one by the same material and forms the case 32 by insert molding further, it can cut down part mark, can decrease the process for assembly, and can realize curtailment of a manufacturing cost.

[0059] Moreover, since the case 32 is independently formed by the insert molding of rigid resin, a crevice and a joint can be lost from the appearance of the ultrasonic probe 30, appearance can be improved, and the intensity of the ultrasonic probe 30 can be improved simultaneously.

[0060] In addition, although the interconnection cable 2 and the broadcloth cable 4 are connected through a connector 5 with the gestalt of this operation, it is good also as composition which soldered the interconnection cable 2 to the broadcloth cable 4 directly, and omitted the connector 5.

[0061] Gestalt 4. of operation, next the ultrasonic probe concerning the gestalt 4 of operation are explained. Although the ultrasonic probe 10 really formed a case, the ultrasonic lens section, and the bushing section by fabrication, this ultrasonic probe 40 fabricates a case and the ultrasonic lens section to one, and it is made to fabricate the bushing section independently in the gestalt 1 of operation mentioned above. Other composition is the same as that of the ultrasonic probe 10 shown in the gestalt 1 of operation, and gives the same sign to the same component.

[0062] Drawing 9 is the perspective diagram showing the outline composition of the ultrasonic probe 40 which is the gestalt 4 of implementation of this invention. Moreover, drawing 10 is the D-D line cross section of the ultrasonic probe 40 shown in drawing 9. In drawing 9 and drawing 10, the ultrasonic probe 40 has the ultrasonic element 3, the broadcloth cable 4, a connector 5, and a holddown member 6 in the interior. The ultrasonic element 3 is attached to a holddown member 6, and is allotted near the point of a case 42. Moreover, the broadcloth cable 4 connected to the ultrasonic element 3 is connected to an interconnection cable 2 through a connector 5, and an interconnection cable 2 is connected to the ultrasonic image pck-up equipment which is not illustrated. In addition, the broadcloth cable 4, a connector 5, and an interconnection cable 2 are attached and fixed to a holddown member 6.

[0063] A case 42 forms the ultrasonic lens section 41 near the ultrasonic element 3. Moreover, the ultrasonic probe 40 is equipped with the bushing section 43 in the installation section in which an interconnection cable 2 pierces through a case 42. The bushing section 43 is formed of a rubber-like

material, is restricting the incurvation in the installation section of an interconnection cable 2, and functions as the cable protection section which prevents breakage of an interconnection cable 2. Furthermore, a case 42 forms the grasping section 44 which an operator can grasp.

[0064] Power is supplied to the ultrasonic element 3 from the broadcloth cable 4, and it generates an ultrasonic wave. It is completed by the ultrasonic lens section 41 and the generated ultrasonic wave is irradiated for an image pck-up. Moreover, the ultrasonic element 3 receives the reflected wave which is an ultrasonic wave reflected for the image pck-up, changes it into an electrical signal, and is outputted to the broadcloth cable 4. The broadcloth cable 4 is transmitted to the ultrasonic image pck-up equipment which does not illustrate the electrical signal which the ultrasonic element 3 outputted through a connector 5 and an interconnection cable 2. Ultrasonic image pck-up equipment creates the picture for an image pck-up based on the electrical signal received from the interconnection cable 2.

[0065] When picturizing, an operator grasps the grasping section 44 and picturizes by applying the ultrasonic lens section 41 to the part of the request for an image pck-up. At this time, you may apply the solvent for ultrasonic examinations to the candidate for an image pck-up. Moreover, the information inside a living body is acquirable by inserting the point of the ultrasonic probe 40 in the inside of a coelome, i.e., an esophagus, intestines, a vagina, the anus, etc.

[0066] When manufacturing this ultrasonic probe 40, the ultrasonic element 3, the broadcloth cable 4, a connector 5, and an interconnection cable are first attached to a holddown member 6. Next, the bushing section 43 is formed in a holddown member 6. It can continue, a holddown member 6 can be installed in the interior of metal mold in which the cavity corresponding to the case 42 was prepared, and a case 42 and the ultrasonic lens section 41 can really be fabricated by pouring in the silicon resin which functions as an ultrasonic lens in a cavity.

[0067] As explained above, since the ultrasonic probe 40 concerning the gestalt 4 of operation forms the ultrasonic lens section 41 simultaneously at the time of one fabrication of a case 42, it can manufacture a case 42 and the ultrasonic lens section 41 with single metal mold. Therefore, part mark can be cut down, the process for assembly can be decreased, and curtailment of a manufacturing cost can be realized.

[0068] Moreover, since the ultrasonic lens section 41 and the case 42 are really fabricated by one fabrication of the silicon material which functions as an ultrasonic lens, in the grasping section 44, slipping can be prevented and grip nature can be improved. Furthermore, by really fabricating a case 42, a crevice and a joint can be lost from the appearance of the ultrasonic probe 40, and appearance can be improved.

[0069] In addition, although the interconnection cable 2 and the broadcloth cable 4 are connected through a connector 5 with the gestalt of this operation, it is good also as composition which soldered the interconnection cable 2 to the broadcloth cable 4 directly, and omitted the connector 5.

[0070] Gestalt 5. of operation, next the ultrasonic probe concerning the gestalt 5 of operation are explained. Although the ultrasonic probe 10 really formed a case, the ultrasonic lens section, and the bushing section by fabrication, this ultrasonic probe 50 fabricates a case and the bushing section to one, and it is made to fabricate the ultrasonic lens section independently in the gestalt 1 of operation mentioned above. Other composition is the same as that of the ultrasonic probe 10 shown in the gestalt 1 of operation, and gives the same sign to the same component.

[0071] Drawing 11 is the perspective diagram showing the outline composition of the ultrasonic probe 50 which is the gestalt 5 of implementation of this invention. Moreover, drawing 12 is the E-E line cross section of the ultrasonic probe 50 shown in drawing 11. In drawing 11 and drawing 12, the ultrasonic probe 50 equipped the point of a case 52 with the ultrasonic lens section 51, and is equipped with the ultrasonic element 3 inside the ultrasonic lens section 51. The broadcloth cable 4 connected to the ultrasonic element 3 is connected to an interconnection cable 2 through a connector 5, and an interconnection cable 2 is connected to the ultrasonic image pck-up equipment which is not illustrated. Moreover, the ultrasonic lens section 51, the ultrasonic element 3, the broadcloth cable 4, the connector 5, and the interconnection cable 2 are attached and fixed to a holddown member 6.

[0072] A case 52 forms the bushing section 53 in the installation section in which an interconnection cable 2 pierces through a case 52. The bushing section 53 is restricting the incurvation in the installation

section of an interconnection cable 2, and functions as the cable protection section which prevents breakage of an interconnection cable 2. Moreover, a case 52 exposes the ultrasonic lens section 51 near the ultrasonic element 3. Furthermore, a case 52 forms the grasping section 54 which an operator can grasp.

[0073] Power is supplied to the ultrasonic element 3 from the broadcloth cable 4, and it generates an ultrasonic wave. It is completed by the ultrasonic lens section 51 and the generated ultrasonic wave is irradiated for an image pick-up. Moreover, the ultrasonic element 3 receives the reflected wave which is an ultrasonic wave reflected for the image pick-up, changes it into an electrical signal, and is outputted to the broadcloth cable 4. The broadcloth cable 4 is transmitted to the ultrasonic image pick-up equipment which does not illustrate the electrical signal which the ultrasonic element 3 outputted through a connector 5 and an interconnection cable 2. Ultrasonic image pick-up equipment creates the picture for an image pick-up based on the electrical signal received from the interconnection cable 2.

[0074] When picturizing, an operator grasps the grasping section 54 and picturizes by applying the ultrasonic lens section 51 to the part of the request for an image pick-up. At this time, you may apply the solvent for ultrasonic examinations to the candidate for an image pick-up. Moreover, the information inside a living body is acquirable by inserting the point of the ultrasonic probe 50 in the inside of a coelome, i.e., an esophagus, intestines, a vagina, the anus, etc.

[0075] When manufacturing this ultrasonic probe 50, the ultrasonic lens section 51, the ultrasonic element 3, the broadcloth cable 4, a connector 5, and an interconnection cable are first attached to a holddown member 6. Next, a holddown member 6 is installed in the interior of metal mold in which the cavity corresponding to the case 52 was prepared, and the case 52 which consists of a rubber-like material by insert molding, and the bushing section 53 are really fabricated on the front face of a holddown member 6.

[0076] As explained above, since the ultrasonic probe 50 concerning the gestalt 5 of operation forms the bushing section 53 simultaneously at the time of one fabrication of a case 52, it can manufacture a case 52 and the bushing section 53 with single metal mold. Therefore, part mark can be cut down, the process for assembly can be decreased, and curtailment of a manufacturing cost can be realized.

[0077] Moreover, since the bushing section 53 is formed of a rubber-like material, while it fully achieves the function as the cable protection section, in the grasping section 54, it can prevent slipping and can improve grip nature.

[0078] Furthermore, since the ultrasonic lens section 51 is used as the independent parts, the material of a case 52 and the bushing section 53 cannot need the function as an ultrasonic lens, but a cheap material can be used for it, and it can reduce a manufacturing cost further. Moreover, since the ultrasonic lens section 51 is attached to a holddown member 6, it can perform easily positioning with the ultrasonic lens section 51 and the ultrasonic element 3.

[0079] In addition, although the interconnection cable 2 and the broadcloth cable 4 are connected through a connector 5 with the gestalt of this operation, it is good also as composition which soldered the interconnection cable 2 to the broadcloth cable 4 directly, and omitted the connector 5.

[0080] Gestalt 6. of operation, next the ultrasonic probe concerning the gestalt 6 of operation are explained. In the gestalten 1-5 of operation mentioned above, a point is prepared supposing inserting an ultrasonic probe into a coelome, and although it was the composition which attached the ultrasonic element to this point, the ultrasonic probe suitable for especially the use that contacts a body surface here is explained.

[0081] Drawing 13 is the perspective diagram showing the outline composition of the ultrasonic probe 60 which is the gestalt 6 of implementation of this invention. Moreover, drawing 14 is the F-F line cross section of the ultrasonic probe 60 shown in drawing 13. In drawing 13 and drawing 14, the ultrasonic probe 60 equips with the ultrasonic element 3 the end of the case 62 which formed the grasping section 64, and is pulling out the interconnection cable 2 from the end which carries out a right pair to the ultrasonic element 3. As compared with the grasping section 62, the end which allotted the ultrasonic element 3 of a case 62 is large, and equips this end with the ultrasonic lens section 61. The ultrasonic lens section 61 has the field which spread in the right-angled direction to the shaft of a case 62, and

serves as the configuration of having been suitable for the contact for an image pck-up.

[0082] Furthermore, the ultrasonic probe 60 is equipped with the bushing section 63 in the installation section in which an interconnection cable 2 pierces through a case 62. The bushing section 63 is restricting the incurvation in the installation section of an interconnection cable 2, and functions as the cable protection section which prevents breakage of an interconnection cable 2. Furthermore, the bushing section 63 covers the grasping section 64, and functions as a skid.

[0083] Moreover, the ultrasonic element 3 is connected to an interconnection cable 2 through the broadcloth cable 4 and a connector 5, and an interconnection cable 2 is connected to the ultrasonic image pck-up equipment which is not illustrated.

[0084] Power is supplied to the ultrasonic element 3 from the broadcloth cable 4, and it generates an ultrasonic wave. It is completed by the ultrasonic lens section 61 and the generated ultrasonic wave is irradiated for an image pck-up. Moreover, the ultrasonic element 3 receives the reflected wave which is an ultrasonic wave reflected for the image pck-up, changes it into an electrical signal, and is outputted to the broadcloth cable 4. The broadcloth cable 4 is transmitted to the ultrasonic image pck-up equipment which does not illustrate the electrical signal which the ultrasonic element 3 outputted through a connector 5 and an interconnection cable 2. Ultrasonic image pck-up equipment creates the picture for an image pck-up based on the electrical signal received from the interconnection cable 2.

[0085] When picturizing, an operator grasps the grasping section 64 and picturizes by applying the ultrasonic lens section 61 to the part of the request for an image pck-up. At this time, you may apply the solvent for ultrasonic examinations to the candidate for an image pck-up.

[0086] Here, the bushing section 63 and a case 62 form like the form 2 of operation using two color molding. By using two color molding, the metal mold used for manufacture of the ultrasonic probe 60 can be reduced, it can cut down like an erector, and a manufacturing cost can be held down.

[0087] Moreover, since the bushing section 63 is formed of a rubber-like material, while it fully achieves the function as the cable protection section, in the grasping section 64, it can prevent slipping and can improve grip nature.

[0088] In addition, in the gestalt 6 of this operation, although considered as the configuration of having been suitable for especially the image pck-up that contacts based on the ultrasonic probe shown in the gestalt 2 of operation, you may apply the configuration of the gestalt of this operation to the ultrasonic probe shown in the gestalten 1-5 of operation.

[0089] In addition, although the interconnection cable 2 and the broadcloth cable 4 are connected through a connector 5 with the gestalt of this operation, it is good also as composition which soldered the interconnection cable 2 to the broadcloth cable 4 directly, and omitted the connector 5.

[0090]

[Effect of the Invention] Since according to invention concerning the 1st viewpoint the number of required metal mold can be decreased and grip nature can be further improved by forming the case, the ultrasonic lens, and the cable protection section of an ultrasonic probe by one fabrication of a single material as mentioned above, the effect that the good ultrasonic probe of grip nature can be offered by the low cost is done so.

[0091] Moreover, since the number of required metal mold can be decreased by forming an ultrasonic lens and the cable protection section by one fabrication of a single material according to invention concerning the 2nd viewpoint, the effect that the good ultrasonic probe of grip nature can be offered by the low cost is done so.

[0092] Moreover, since the number of required metal mold is decreased and the intensity of an ultrasonic probe is made to improve by forming a case in the front face of the ultrasonic lens really formed by fabrication, and a cable attaching part according to invention concerning the 3rd viewpoint, the effect that the good ultrasonic probe of grip nature can be offered by the low cost is done so.

[0093] Moreover, since the number of required metal mold is decreased and grip nature is made to improve further by forming the case and ultrasonic lens of an ultrasonic probe by one fabrication of a single material according to invention concerning the 4th viewpoint, the effect that the good ultrasonic probe of grip nature can be offered by the low cost is done so.

[0094] Moreover, since the number of required metal mold is decreased and grip nature is made to improve further by forming the case and the cable protection section of an ultrasonic probe by one fabrication of a single material according to invention concerning the 5th viewpoint, the effect that the good ultrasonic probe of grip nature can be offered by the low cost is done so.

[0095] Moreover, according to invention concerning the 6th viewpoint, by preparing the cable protection section which covers the grasping section of an ultrasonic probe, since the grip nature at the time of work is made to improve, the effect that the good ultrasonic probe of grip nature can be offered by the low cost is done so.

[0096]

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**CLAIMS**

[Claim(s)]

[Claim 1] The ultrasonic element which oscillates an ultrasonic wave and changes the reflected wave of the ultrasonic wave concerned into an electrical signal The cable which performs the supply of power to the aforementioned ultrasonic element, and transfer of the aforementioned electrical signal It is the ultrasonic probe equipped with the above, and the aforementioned ultrasonic element stores, and it is prepared in the case which prepared the grasping section which an operator can grasp, and the installation section of the aforementioned cable, it has the cable protection section which restricts incurvation of the cable concerned, and the ultrasonic lens which performs in convergence of the aforementioned ultrasonic wave, and it carries out having really formed the aforementioned case, the aforementioned ultrasonic lens, and the aforementioned cable protection section by fabrication as the feature.

[Claim 2] The ultrasonic element which oscillates an ultrasonic wave and changes the reflected wave of the ultrasonic wave concerned into an electrical signal The cable which performs the supply of power to the aforementioned ultrasonic element, and transfer of the aforementioned electrical signal It is the ultrasonic probe equipped with the above, and the aforementioned ultrasonic element stores, and it is prepared in the case which prepared the grasping section which an operator can grasp, and the installation section of the aforementioned cable, it has the cable protection section which restricts incurvation of the cable concerned, and the ultrasonic lens which performs convergence of the aforementioned ultrasonic wave, and it carries out having really formed the aforementioned ultrasonic lens and the aforementioned cable protection section by fabrication as the feature.

[Claim 3] The aforementioned case is an ultrasonic probe according to claim 2 characterized by being formed in the front face of the aforementioned ultrasonic lens really [ aforementioned ] formed of fabrication, and the aforementioned cable protection section.

[Claim 4] The ultrasonic probe carry out having oscillated an ultrasonic wave, being the ultrasonic probe which has the ultrasonic element which changes the reflected wave of the ultrasonic wave concerned into an electrical signal, and the cable which perform the supply of power to the aforementioned ultrasonic element, and transfer of the aforementioned electrical signal, having stored the aforementioned ultrasonic element, having had the case which prepared the grasping section which an operator can grasp, and the ultrasonic lens which perform convergence of the aforementioned ultrasonic wave, and having really formed the aforementioned ultrasonic lens and the aforementioned case by fabrication

[Claim 5] The ultrasonic element which oscillates an ultrasonic wave and changes the reflected wave of the ultrasonic wave concerned into an electrical signal The cable which performs the supply of power to the aforementioned ultrasonic element, and transfer of the aforementioned electrical signal It is the ultrasonic probe equipped with the above, and the aforementioned ultrasonic element is stored, and it is prepared in the case which prepared the grasping section which an operator can grasp, and the installation section of the aforementioned cable, has the cable protection section which restricts incurvation of the cable concerned, and carries out having really formed the aforementioned case and the

aforementioned cable protection section by fabrication as the feature.

[Claim 6] The ultrasonic element which oscillates an ultrasonic wave and changes the reflected wave of the ultrasonic wave concerned into an electrical signal The cable which performs the supply of power to the aforementioned ultrasonic element, and transfer of the aforementioned electrical signal It is the ultrasonic probe equipped with the above, and the aforementioned ultrasonic element is stored, and it is prepared in the case which prepared the grasping section which an operator can grasp, and the installation section of the aforementioned cable, it has the cable protection section which restricts incurvation of the cable concerned, and the ultrasonic lens which performs convergence of the aforementioned ultrasonic wave, and the aforementioned cable protection section carries out covering the aforementioned grasping section at least as the feature.

[Claim 7] The ultrasonic probe according to claim 6 characterized by forming the aforementioned cable protection section and the aforementioned case by the two color molding using common metal mold.

[Claim 8] The ultrasonic probe of any one publication of the claim 1-7 characterized by having had further the holddown member which fixes the aforementioned ultrasonic element, and forming the aforementioned case, the aforementioned ultrasonic lens, and the aforementioned cable protection section in the front face of the holddown member concerned.

[Claim 9] The aforementioned holddown member is an ultrasonic probe according to claim 8 characterized by having the positioning section which positions the aforementioned ultrasonic element, and determining the physical relationship of the aforementioned ultrasonic element and the aforementioned ultrasonic lens section by the positioning section concerned.

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[Translation done.]

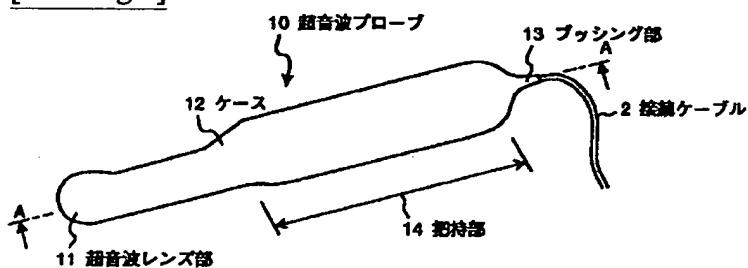
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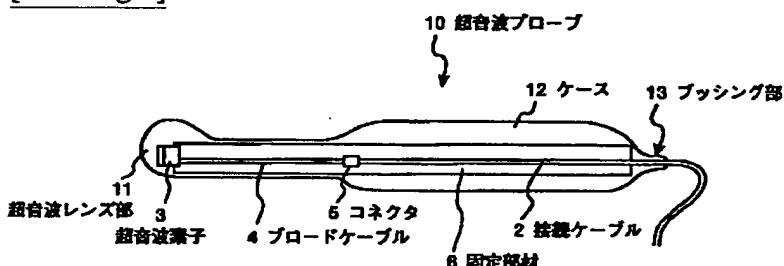
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DRAWINGS

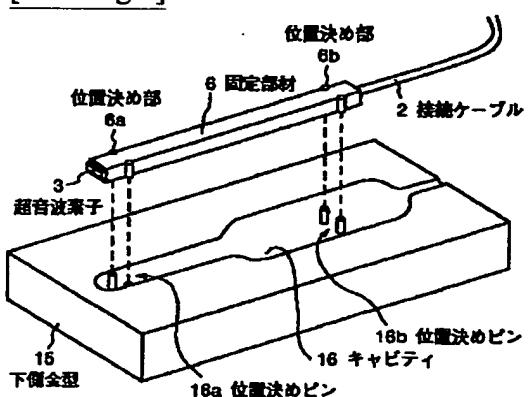
[Drawing 1]



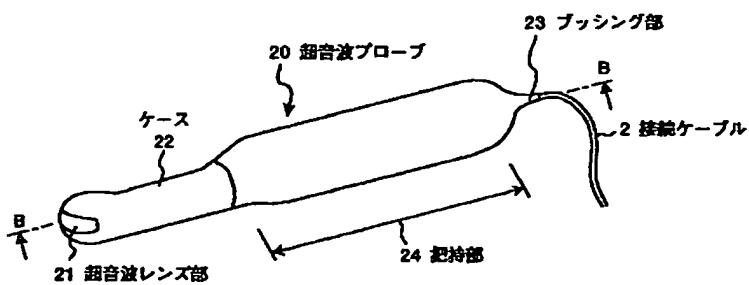
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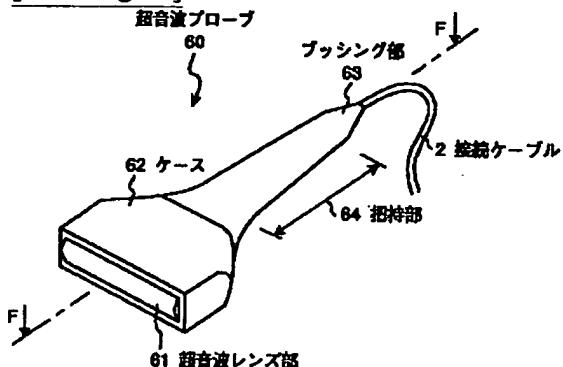
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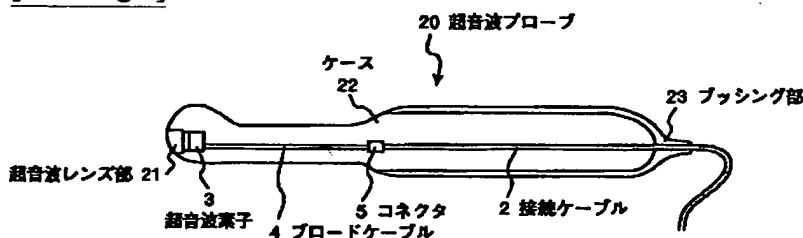
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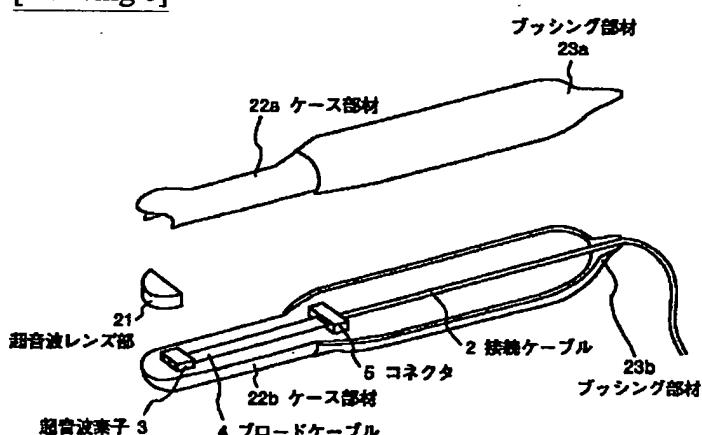
[Drawing 13]



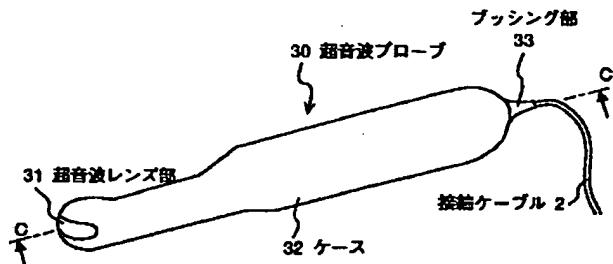
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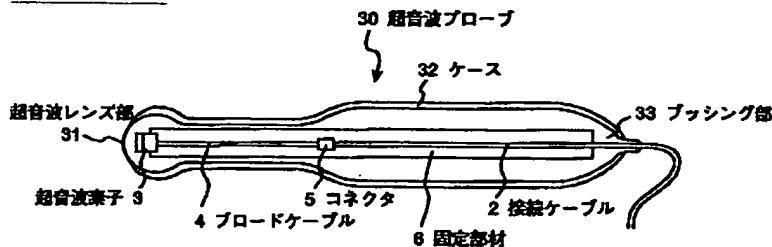
[Drawing 6]



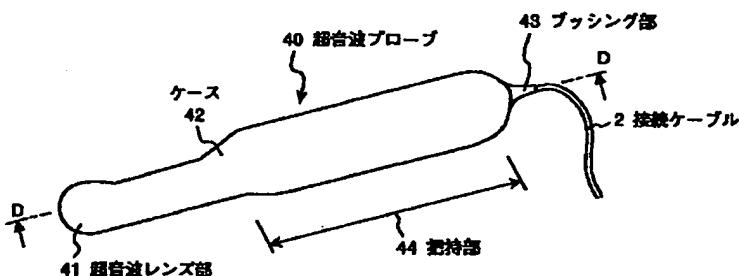
[Drawing 7]



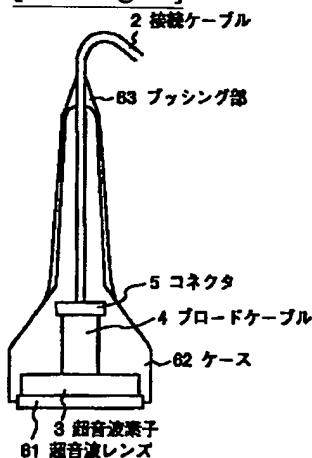
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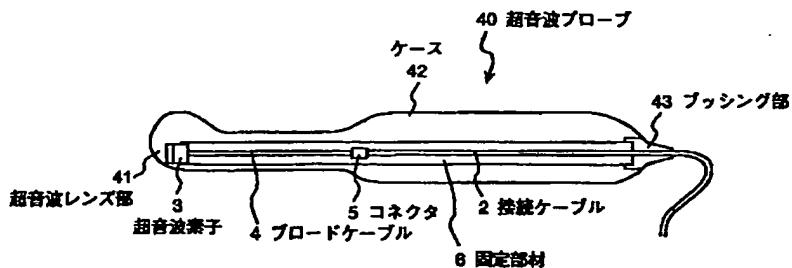
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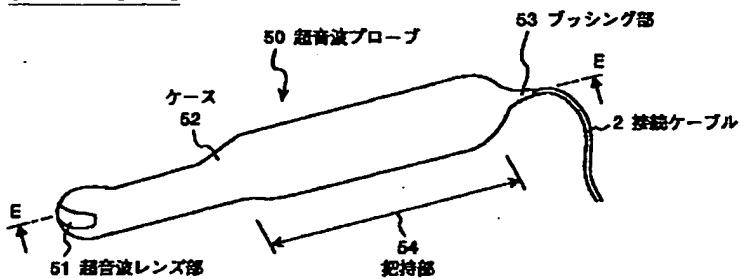
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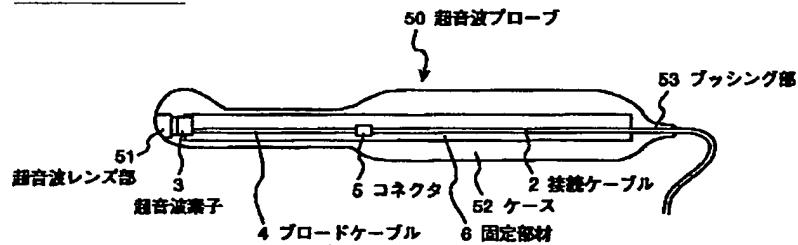
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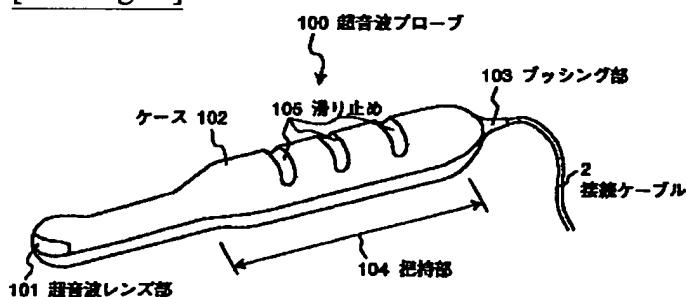
[Drawing 11]



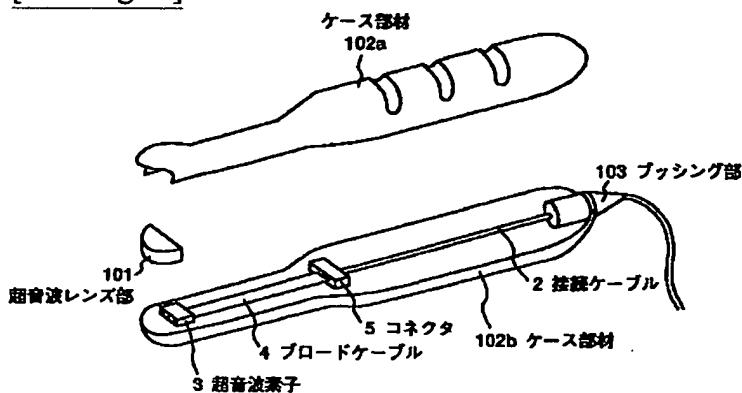
[Drawing 12]



[Drawing 15]



[Drawing 16]



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[Translation done.]